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ABSTRACT

Principles of aesthetic design for printed instructional materials are discussed in this paper, and a checklist is provided to aid in evaluating the aesthetics of such materials. The principles that are discussed relate to the following areas: format (spatial arrangement of a page and design principles involving simplicity, unity, emphasis, balance, and proportion), typography (legibility, type faces, and type size), illustrations, color, and graphs and tables. The checklist provides space for indicating the presence or absence of 45 features related to layout, type, color, graphs and tables, and illustrations. Also included are a selected bibliography of relevant works and illustrations of a few of the principles discussed. (GW)

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Aesthetic Guidelines to Printed Instructional Materials

By

Jo LeMay

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INTRODUCTION

With the great proliferation of individually-produced learning materials, there seems to be no shortage of excellent sources which deal with the processes of materials construction. Often an educator who wishes to develop printed instructional materials can use books or programs that are designed so anyone can proceed through a series of steps and arrive at a satisfactory product. Bullough (1974) refers to this approach as the "cookbook" approach. He further states "If what is desired is a product that derives from a strict adherence to a standard prescription, the how-to-do-it sequenced technique will get the job done" (p. 69). However, Bullough also reports that the end result of the cookbook approach is techniquely acceptable but aesthetically uninteresting. Tom Suzuki (1973), Director of Design of Psychology Today textbook division, says that students today are more visually sophisticated than ever before. "They read less and depend more on visual images to acquire information " (p. 52). In contrast to many of the great attention-getters that are produced for commercial concerns, the typical locally-produced educational layout incorporates minimal stimuli in a "form-follows-function" manner that provides little in the way of visual stimuli(Bullough, 1974). Twyford (1969) comments that because of the widespread use of currently available materials it would be educationally desirable to have materials tested and improved as much as possible. He further indicates to do this requires complete knowledge of what elements contribute to effective instructional materials.

In order to accomplish this task Gabrulse (1966) states,

> The development of a graphics (visual) technology for the production of instructional materials requires sifting through thousands of devices, techniques, materials and processes used in each discipline (p. 76).

OBJECTIVES

It will be the intent of this paper to:

1. research the areas of color, printing, illustration, and format.
2. report the principles and guidelines of those areas.
3. develop a checklist to evaluate printed instructional materials.

LIMITATIONS

Since devices in the affective area are so very difficult to construct and the data so difficult to analyze adequately, the checklist will be limited to the criteria that are the most concrete to evaluate. Bullough (1974, p. 74) indicates, "We may never possess anything but rather cursory knowledge of the intricasies of aesthetics." He goes on to say that while we may not know precisely what long range affects may be produced through the stressing of good design, the effect will certainly not be deterimental.

GUIDELINES

The following areas that relate to aesthetic design of printed instructional materials will be discussed. They are 1) format, 2) typography, 3) illustrations, 4) color and 5) graphs and tables.

Format

Suzuki (1973) declared that a book with good text is only half a book. The other half is good design; and this means more than specifying type to fit the space available. In order to adequately cover format, two areas will be discussed. They are spatial arrangement of a page and design principles.

Spatial Arrangement of a Page

1. According to printing practices around 1932 the area of printed matter should occupy about 50 percent of the total average page size. This still holds true today even though readers are unaware of this fact. A study done by Tinker (1963) showed that over 90 percent of the readers tends to believe that 60 percent or more of the total page is devoted to print. The modal estimate was 75 percent. This phenomenon is called the whole-part proportion illusion. But experimental results of the same study show material on a flat page with no margins at all is just as legible as material with the usual large margins. But Tinker contended that relatively wide margins (50 percent print, 50 percent margin) are more pleasing in terms of aesthetics. His respondents reported ample margins improved the material even though statistically there was no significant difference.

2. Curvature of printed material, like that found near the inner margins of books and bound journals, significantly reduces the speed of reading and visability of print. This loss of legibility can be alleviated by the use of wider inner or "gutter" margins. Those margins should be at least 7/8" or greater for proper legibility. (See Figure 1)

3. Tinker's studies (1963) in legibility also covered the use of columns. The results showed the preference of both readers and typography experts to be a double column page. Two out of three respondents chose two column justifying the current practice of this format.

4. The indention of the first line of a paragraph improves legibility by over 7 percent (Tinker, 1963).

5. Words read vertically are read markedly slower than the customary horizontal arrangement.

6. Open space around visual elements and words prevent a crowded feeling (Kemp, 1975).

7. Body copy should always have an even left hand margin (Brady, 1975).

Design Principles

In planning printed instructional materials, one should become aware of certain design principles. These principles include simplicity, unity, emphasis, balance, and proportion.

Simplicity-is the element of design that concerns the number of elements in a given space. An aesthetically pleasing page is one that has divided the space into the fewest segments possible. But if the materials are composed of lengthy and complex data, it is better to subdivide or redesign the page into a number of easy-to-read segments.

Unity-applies to the oneness of a page or display. Unity can be built into materials by the use of a common background, placing borders around certain elements, use of common symbols and shapes, and a common color theme carried through the materials.

Emphasis-refers to that part of the page that catches the eye. Since type must be positioned pleasantly on the page, this must be planned. Normally one would consider mathematical center as the most aesthetic position of emphasis. But studies show the eye does not accept the mathematical center as a satisfactory position (Bain, 1970). It greatly prefers a higher situation. A good proportion to observe is to place your emphasis 3/8ths down the page. For example, this principle is important when considering a title page. The group of type lines forming the title will occupy a position equally above and below this line. (See Figure 2)

Emphasis can be demonstrated in the body of the copy by 1) type size and weight, 2) use of contrasting type and 3) by arrangement of elements. (See Figure 3)

Balance-has two forms. They are formal and informal. Formal is identified by an imaginary axis running through the center of the page dividing the design so one half will be the mirror reflection of the other half. Informal balance is asymmetrical. For titles or headings a symmetrical balance is formal in effect. It requires accurate positioning of letters and extra care in drawing to insure even margins. Large pictures should be offset by a cluster of small ones or a large, dull illustration could be balanced by a small bright one. Blocks of copy can be used in one area and pictures could be positioned in other

areas to achieve balance.

Proportion-must be considered when choosing margin widths on single and facing pages. When determining decorative borders, page size or area to be covered by type,you must consider the following proportion principles.

1. In general, margins on a single page should be such that the type area is optically centered. This means that the type area should be mathematically centered side to side (except for gutter margins for books) and optically centered top to bottom. (Whatever measurements you decide to use a good rule of thumb is to have the bottom margin slightly larger than the top.)

2. To determine margins on facing pages, typographers follow this general rule. Decide on how wide you want the outside margin. The insides margin should be half to three-quarters of the outside margin width.

3. When ruled or decorative borders are used, the margin outside-the-border should be greater than the margin inside-the-border. The usual relationship is three to two, outside to inside. In other words, the outside margin should be about one and a half times as wide as the margin inside the border.

4. When considering a page size, the standard proportion is two to three width to height. For example, a standard six by nine inch page size is exactly a two to three proportion.

Typography

Research done by Tinker (1963) provides information for the designer to achieve the development of more legible materials. He indi-

cates that aesthetic taste in type need not be sacrificed for legibility. There are some practical considerations that affect the selection of fonts.

Legibility

There is considerable variation in the legibility of the different type founts. The following items should be considered before selecting type.

1. Individual capital letters are more legible than lower case letters of the alphabet in terms of visibility at a distance.

2. Lower case letters differientiate. In other words, more recognizable words forms are found in words printed in lower case.

3. Arabic numbers are read significantly faster and much more accurately than Roman numerals.

4. All capital print greatly retards the speed of reading in comparison with lower case type. Faster reading of lower case print is due to the characteristic word forms furnished by this type. This permits reading by word units. All caps printing takes at least one third more space than lower case, so more fixation passes are required for reading the same amount of material. Use of all caps should be dispensed in any body copy.

Type Faces

Tinker reports that all the common founts are equally legible. According to his studies there must be a marked difference in type faces such as Cloister black vs. Scotch Roman before there is any significant difference in legiblity. However, there are some points that need to be mentioned to serve as guidelines.

1. Readers prefer type face that appears to border on Boldface such as Antique and Cheltenham.

2. Italic print is somewhat read more slowly than ordinary lower case. Furthermore, when italics are combined with a marginal condition and type size, reading is retarded. In general, the use of italics should be restricted to those rare occasions when added emphasis is needed. Avoid all cap italic headings.

3. Boldface type is read at the same rate as ordinary lower case, so it can be employed effectively for emphasis without the loss of legibility. But it should not be used for large amounts of text. Don't emphasize everthing. Brady (1975) mentions the adage "If you emphasize everything, you've emphasized nothing."

4. Material printed in mixed type forms markedly retards the speed of reading. Brady (1974) emphasizes using one type throughout all the headlines and text. He explains that this is an aesthetic consideration. The Oklahoma Vocational Teaching Unit on Basic Design suggests that if more than one family of type is used, the two should have at least the same general shape characteristics in common.

5. Use numerals instead of bullets (-) whenever possible.

6. Select readable type, like sans serif, to avoid confusion (Kemp, 1975).

7. Avoid using Old English or Script in all caps.

8. Hand lettering should be professionally done to maintain legibility

9. Burt's (1959) Psychological Study of Typography found that type faces similar to Old Style Antique appeared most appropriate for

children under 12 while Imprint Plantum or New Times Roman suited those over 12.

Type Size

Different studies have computed type sizes for certain ages as well as the most efficient type size for reading.

1. A line should not be longer than one and a half to two alphabets in any particular type size (Brady, 1975).

2. Body text should not be set in type smaller than ten point. Tinker (1963) proves this in legibility study by an analysis of eye movement. With ten point type being the average size, it was determined that 11 point was read the best. The analysis of eye movement patterns revealed that very large and very small type (above 12 and below 8 point) was read more slowly than 11 point.

Illustrations

There are alternative techniques for presenting information that one might normally present in prose. Siegel(1974) suggests that these alternative approaches may result in improved comprehension and/or performance. Illustrations is one method. They save time because fewer words have to be written to describe a situation. In studies using word associations techniques, Otto (1962, 63, 64) concluded that visual stimuli evoked more sense impression association than do verbally presented stimuli. Wimer and Lambert(1959) claimed that this converging effect causes visuals to have a greater effectiveness as stimuli. The following items should be taken into consideration in preparing illustrations.

1. Avoid unnecessary artwork since it may serve to distract.

2. Use identifiers or prompting agents to help orient the reader. In a study on visual prompting on learning by Aist and Gerlach (1973), it was proven that students became "prompt-dependent." So when prompting agents (like color or symbols) were changed within the learning materials, the desired learning response could not be elicited. Be sure to keep the same identifiers throughout the materials.

3. Use simple, bold lines and leave out as much detail as possible.

4. Use directional arrows to direct the reader.

5. All text appearing on the illustration should be in an area that will not affect the readibility of the illustration.

6. Color illustrations are often placed in a special signature space.many pages away from their discussion. This is bad design.

7. Label all illustrations. All pictures should be supplemented with print. Words are important in your materials, but generally they should be secondary to the pictures. They can direct attention, explain details, raise questions, serve as transitions from one picture or idea to the next, and aid in preserving the continuity of the materials. If the materials have too many words to explain the picture, perhaps the picture deserves another critical evaluation. Let the picture tell the greater part of the story.

8. Limit verbal content to 15-20 words if the picture is to be the main emphasis.

Color

Color is one of the most common of the design elements that is employed in an aesthetic or decorative manner. Many studies have been conducted on the effects of color on students (Miller, 1938, Traver, 1969). All these studies were strictly preference studies. It was found that the addition of color to a visual dramatically increased the possiblity that the visual would be interpreted as one that was dynamic.

Finally, a study published in 1972 (Katzman and Nyvenhuis) indicated the addition of color to a visual has the effect of increasing the recall of "peripheral" material (not of central material).

1. Kemp (1975) explains that color is an important aspect in most graphics, but it should be used sparingly for visuals. It should be applied to elements that need emphasis,to give separation or to enhance unity.

2. Select colors that are harmonious together. Colors that are dissonant (of equal intensity and complementary on the color wheel, like orange-blue or red-green) create annoyance and consequently interferes with the clear perception of the message.

3. The attractiveness of a black/white drawing is greatly enhanced by the addition of shading or color.

4. By using certain color combinations,you can often clarify comple designs. For example, since yellow and orange are colors of high visibility,black lines on a yellow or orange background will command more attention. The brighter and stronger the color, the quicker and keener the interest.

5. Use black print on white or tinted paper.

Graphs and Tables

Too often the non-specialist reader finds the purpose and meaning of graphs and tables difficult to comprehend and this results in wasted information. Any instructional materials using this kind of information should be made so that it is easy to comprehend and more self-explanatory.

1. One method of achieving this objective is a technique familiar to advertisers and "journalist--the headline." A headline is a simple statement of a visual which gives the table's meaning in summary form (Simpson, 1973).

2. Consistent use of promoters or identifiers. This means the same color or symbols are used throughout the graphs and tables. In Aist and Gerlach (1973) study on the effect of visual prompting on learning found, that they learner responses become "prompt dependent" on certain stimuli. When that stimuli was changed the desired response was not forthcoming.

3. Use few Roman numerals as opposed to Arabic numbers. Roman numerals require more fixations, a longer pause duration and more regressions. Tinker's study (1963) shows progress in ordinary reading breaks down when a numeral of three or more digits is encountered in the text.

Make mathematical signs more legible by making them larger than the size print used or strikingly different face.

5. Numerals in the column which lists the base numbers should be printed in bold face.

6. Label all parts of the graph and tables. Gropper (1966) concluded that the words serve as an important cueing role.

7. Numerals in eight point type are more legible than seven.

8. The more columns used in a table, the less legible it is. The average number of correctly perceived items by column is 5.21 (Tinker, 1963).

Summary

Aesthetics in instructional materials design is often thought of as nothing more than "frosting on the cake". In other words, additional effects that actually may not in and of themselves assure greater increments of learning. And the paucity of research in retention of visual aesthetics continues to bear this out. However, there is enough practical information to develop guidelines to maximize learning from instructional materials. Due to the limited time of this paper, only those aspects of aesthetics that can be positively identified will be included on the checklist. This still leaves a broad area in the affective domain untouched. It could become a gold mine for future research.

APPENDIX

Name of Materials_____

Class used_____

Aesthetic Instructional Materials Checklist

DIRECTIONS: The guidelines listed below are criteria to judge aesthetics of instructional materials. When applicable to your materials, you will check (✓) present if the guidelines are observed or check (✓) absent if they are not observed.

GUIDELINES	PRESENT	ABSENT
A. Layout		
1. Printed matter should ideally cover 50 percent of the page and not more than 75 percent.		
2. More than 7/8" for inside gutter margin. (Inside margin 1/2" to 3/4" of the width of the outside margin)		
3. Use of double column		
4. First line of paragraph is indented.		
5. Enough white space to avoid crowding.		
6. More words printed in the horizontal arrangement rather than vertical.		
7. Title page has the emphasis around the 3/8ths from the top of the page.		
8. The page is balanced. (Equal side margins except for gutter)		
9. More white space for the bottom of the page than the top.		
10. The page has the appearance of unity or oness through a common color background, lines or borders.		
11. If decorative borders are used, the outside border is one and a half times as wide as the margin on the inside of the border.		
12. Page size is approximately a two to three ratio.		
13. Even left-hand columns are used.		

GUIDELINES	PRESENT	ABSENT
B. Type		
13. If viewed at a distance greater than arms length the use of all caps is employed.		
14. If viewed at arms length or closer the lower case fonts are used with caps.		
15. Use of type close to Boldface or Sans Serif.		
16. Lack of italic headlines.		
17. Lack of italic print except for headlines.		
18. Use of one family of type for text.		
19. Lack of Old English or Script in all caps.		
20. Type size is between 9-11 pt.		
21. Lack of widows.		
22. Use of numerals instead of bullets.		
23. Use of professional handlettering instead of amateur.		
C. Color		
24. Color used for emphasis.		
25. Color used consistently in a theme throughout the learning materials.		
26. Colors selected are harmonious.		
27. Colors selected have a high intensity value.		
28. Use of color for children's materials.		
29. Use of color for cueing.		
30. Lack of white print on black for large areas.		
31. Use of 10-14 pt. type if white print is used on black.		
32. Colors selected are contrasted in terms of color of ink vs. paper.		

GUIDELINES	PRESENT	ABSENT
Color con't		
33. Selection of cool colors for background.		
34. Selection of warm colors for titles and visuals over the background.		
D. Graphs and Tables		
35. Use of Arabic numbers in heading the tables or graphs.		
36. Use of larger than seven-point type.		
37. Numerals which list the base number of a table is in bold print.		
38. Cues or prompters are used.		
39. Columns that are used are not over five cloumns per table or graph.		
40. All graphs are labelled with headlines.		
E. Illustrations		
41. Simple, bold lines are used if black and white drawings are used.		
42. Picture symobls are outlined with a heavy line.		
43. Use of no more than two types of art styles.		
44. All illustrations are labelled.		
45. Illustrations are near description in the text.		

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GUTTER MARGINS

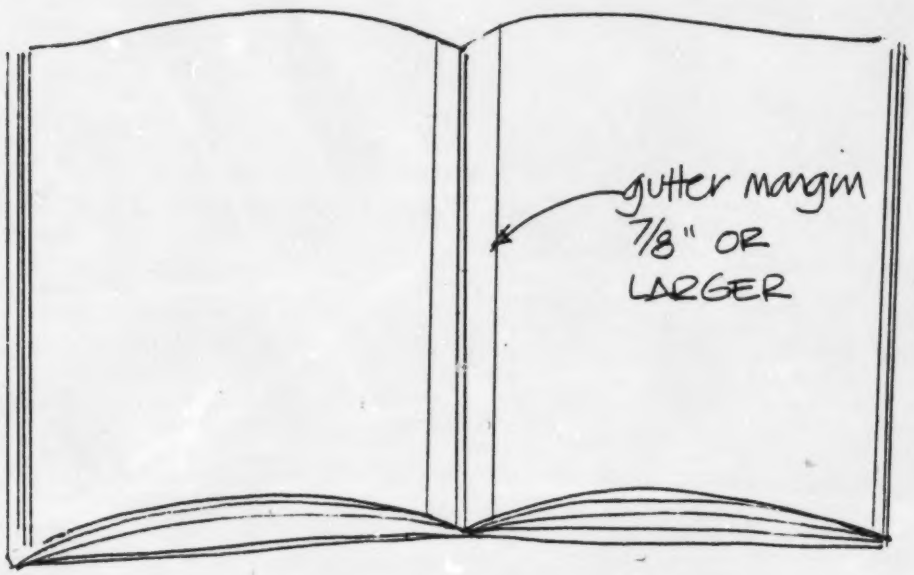


Figure 1

TITLE PAGE PROPORTION

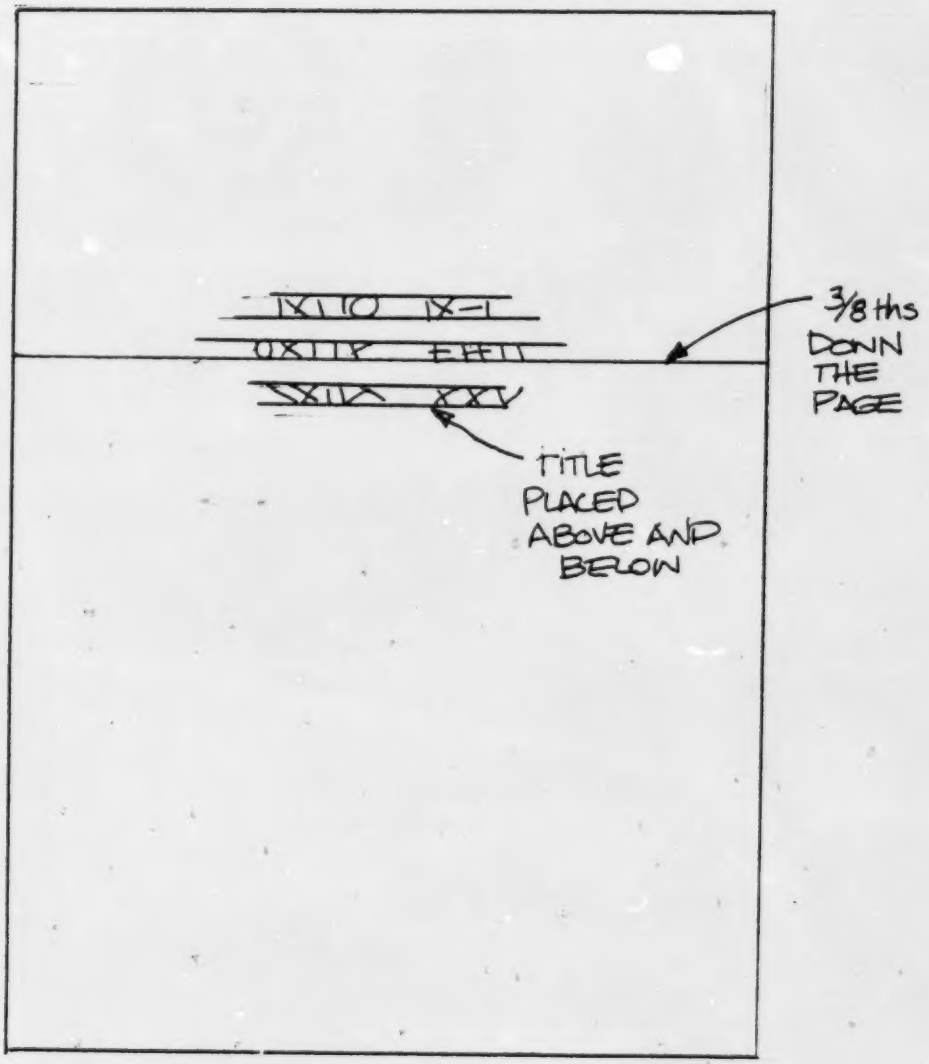
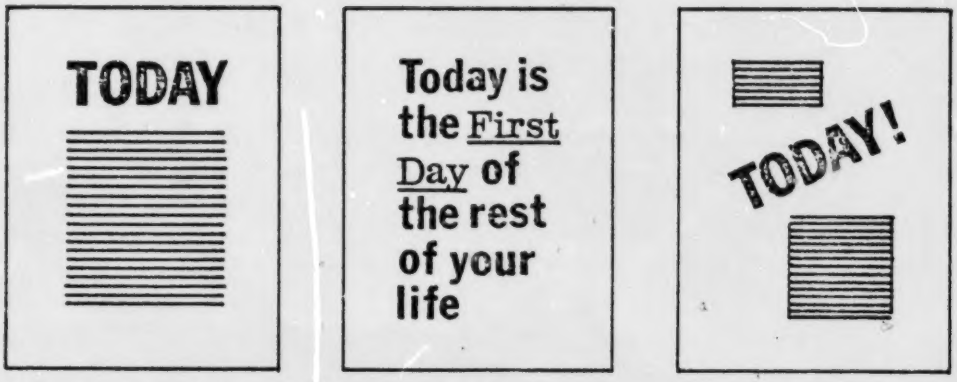


Figure 2

TYPES OF EMPHASIS



Emphasis by Type, Size and Weight

Emphasis by Use of Contrasting Type

Emphasis by Arrangement

Figure 3